NICE^3
Success Story

Waste-Minimizing Plating Barrel

Waste-Minimizing Plating Barrel Increases Productivity

Benefits

- Through 2000, the cumulative energy savings have been over 979 billion Btu
- Through 2000, the cumulative reduction in NO_x emissions have been 207 tons and the cumulative CO_2 reduction has been 62,800 tons
- Energy savings of 15% over traditional plating barrels
- Reduced process time and increased productivity of more than 22%
- Reduced solid waste and wastewater due to enhanced drainage and rinsing properties
- Allows the use of plating solutions of lower concentration due to increased chemical solution flow

Applications

This innovative technology can be used in metal-plating operations, metal finishing and electroplating.

Whyco Technologies, Inc., has developed an innovative perforated plating barrel that has helped the company reduce energy use by 15%, eliminate more than 2,400 tons/year in solid waste, and reduce waste water by more than 17,000 gallons/day. The resulting cost savings total more than $500,000 annually. The company has manufactured and sold more than 560 of these barrels to other electroplating companies, which are reporting up to a 40% increase in plating productivity and up to a 60% decrease in loss of plating solution due to "drag out." Drag out refers to the amount of chemical solution held in the barrel holes as the result of capillary action.

Whyco Technologies, Inc., is a metal finishing and electroplating company that has been in business since 1946. The company developed the high-efficiency plating barrel when existing technologies in the marketplace failed to meet its need for increased transfer efficiency of solution inside the plating barrel and improved current flow.

This article contains information on Whyco's partnerships with the NICE^3 (National Industrial Competitiveness through Energy, Environment, and Economics) Program, benefits of its barrel design, the energy savings and pollution prevented, and its marketing success.

Whyco Plating Barrels

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Partnership with the NICE³ Program

Once Whyco developed and began using the barrel, the company realized it had an innovative product that potentially could be sold to other metal finishing companies. To acquire additional funding to further develop, manufacture, and market the barrel, Whyco teamed with the U.S. Department of Energy and received a $390,000 grant from the NICE³ Program. The federal government's show of support increased product visibility with potential customers. The addition of the NICE³ grant to Whyco's own investment of over $690,000 provided the additional boost that Whyco needed to diversify beyond electroplating to barrel production in support of the electroplating industry nationwide. Based on the agreement with NICE³, Whyco focused on three goals in its development efforts:

- Further develop the prototype barrels being used at Whyco to a final commercial design.
- Develop manufacturing techniques and purchase equipment to allow over 100 barrels to be commercially produced each month.
- Develop marketing, sales, and distribution expertise and networks so that energy, waste, and cost savings can be realized by the plating industry nationwide.

The barrel had been undergoing continuous improvement during the several years of its operational use at Whyco. After additional testing, Whyco found that the prototype only needed minor modifications to be ready for the market. Whyco engineers now believe that they have a product they can sell "as is" or modify for any special needs identified by the customer.

In anticipation of commercial production, Whyco built a large manufacturing facility, developed manufacturing techniques, and purchased all of the necessary equipment to produce the barrels. Whyco set out to make its product more visible by attending trade shows and conferences, placing ads and articles in trade journals, and conducting direct-mailing campaigns.

Other Information on the Whyco Barrel:

Graves, Beverly A.
October 1997
"Finishing Opportunities: Whyco Chromium works with its customers to develop the right finish for the part."
Products Finishing

LaVine, Mark
July 1997
"Taking a Closer Look: The true story of one firm's strive for a better technology."
Connecticut's Environment: Business, Technology & The Environment

Murphy, Michelle M.
December 1997/January 1998
"Connecticut firms leaders in prevention pollution."
The Journal of the Connecticut Business & Industry Association (CBIA) News

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Project Partners

- Connecticut Department of Environmental Protection
  Hartford, CT
- Whyco Technologies, Inc.
  Thomaston, CT

Benefits of the Whyco Barrel Design

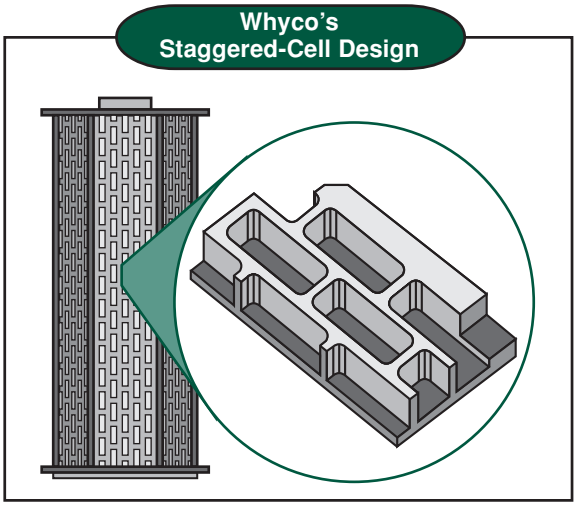
The traditional polypropylene plating barrel design has a wall thickness ranging from one-half inch to one inch, with thousands of holes drilled into the walls to allow electrical current and plating solution into the vessel. The wall thickness was required to provide adequate structural integrity. However, it lowered the efficiency of transferring plating solution into and out of the barrel, and it diminished the ability to push electrical current through the holes and onto the parts being plated.

The Whyco barrel is constructed by machining a staggered pattern of rectangular-shaped pockets into the traditional thick-walled polypropylene barrel. After machining, the barrel's structure resembles a honeycomb formation to which thousands of small, now shorter, holes are drilled. This patented staggered-cell design allows for the greatest number of holes per open area while maintaining the structural integrity. This thinned-walled honeycomb structure was found to increase the hydrodynamic pumping action during barrel rotation, creating greater solution transfer than with traditional barrel design.

Additional benefits of the Whyco barrel are:

- higher current density plating, leading to faster plating cycles
- reduced bath concentration due to higher mass transfer rates
- better plating of difficult chemistries such as alloy plating.

In addition to performance evaluations of the barrel in Whyco operations and customer feedback, efficiency tests were performed to provide performance data to potential customers.



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Energy Savings and Pollution Prevention

Electricity savings from the Whyco barrel are derived from increased system efficiency, reduced operating hours for the production and pollution-control equipment, and a reduced need for circulating pumps. Energy savings vary depending on the size of barrel and its type and volume of use. For an electroplating plant that has 50 plating barrels, running 65,000 plating cycles/year, the energy savings are estimated to be 23.9 billion Btu/year for each plant. With more than 840 barrels currently in use, the estimated energy savings is over 400 billion Btu/year. The resulting reduction in carbon dioxide emissions from reduced electricity generation is estimated at over 25,000 tons/year. Assuming 50% of the 100,000 plating barrels are replaced with the Whyco barrel by the year 2010, the projected energy savings would be 25.2 trillion Btu/year, resulting in an estimated reduction in carbon dioxide emissions of over 1.5 million tons.

Marketing Success

Whyco is now using more than 280 of the new barrels and will replace the remainder of their old plating barrels as soon as possible. Others in the barrel-plating industry are currently using more than 560 barrels. Whyco is marketing its barrel as a mid-priced replacement for existing barrels. In the United States today, 4000 barrel-plating companies use an estimated total of 100,000 plating barrels. Whyco expects continued repeat business because companies that have tried the Whyco barrel have experienced such good results that replacing other existing barrels in the facility is viewed as a good business decision. Whyco is also looking to market the barrels internationally and is investigating applications in the electronics industry.

Whyco already has many satisfied and repeat customers. For example, John Bourget, President of Custom Metal Crafters, Inc., in Newington, Connecticut, wrote “The Whyco barrel successfully plated these parts with a quality never before possible in our line. We are so confident that this barrel design will improve our plating process and product quality that we are now in the process of upgrading all of our barrels with Whyco plating barrels.” Customers have realized up to a 40% increase in plating speed resulting from greater exposure to the anode, which in turn produces higher current densities and a faster deposition rate. Customers have also seen up to a 60% decrease in chemical “drag out,” resulting in lower chemical and pollution-related costs. Many companies that have purchased Whyco barrels have provided similar testimonials about increased efficiency and productivity.

NICE³ Program

NICE³ – National Industrial Competitiveness through Energy, Environment, and Economics: An innovative, cost-sharing program to promote energy efficiency, clean production, and economic competitiveness in industry. This grant program provides funding to state and industry partnerships for projects that demonstrate advances in energy efficiency and clean production technologies. Awardees receive a one-time grant of up to $525,000. Grants fund up to 50% of total project cost for up to 3 years.

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